

BLUE MARS

'A MIGHTY TRILOGY... THE ULTIMATE IN FUTURE HISTORY'

DAILY MAIL



KIM STANLEY
ROBINSON

BLUE MARS (Part Seven)

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Part Seven

Making Things Work

An ice-choked sea now covered much of the north. Vastitas Borealis had lain a kilometer or two below the datum, in some places three; now with sea level stabilizing at the minus-one contour, most of it was underwater. If an ocean of similar shape had existed on Earth, it would have been a bigger Arctic Ocean, covering most of Russia, Canada, Alaska, Greenland, and Scandinavia, and then making two deeper incursions farther south, narrow seas that extended all the way to the equator; on Earth these would have made for a narrow North Atlantic, and a North Pacific occupied in its center by a big squarish island.

This Oceanus Borealis was dotted by several large icy islands, and a long low peninsula that broke its circumnavigation of the globe, connecting the mainland north of Syrtis with the tail of a polar island. The north pole was actually on the ice of Olympia Gulf, some kilometers offshore from this polar island.

And that was it. On Mars there would be no equivalent of the South Pacific or the South Atlantic, or the Indian Ocean, or the Antarctic Ocean. In its south there was only desert, except for the Hellas Sea, a circular body of water about the size of the Caribbean. So while ocean covered seventy percent of the Earth, it covered about twenty-five percent of Mars.

In the year 2130, most of Oceanus Borealis was covered by ice. There were large pods of liquid water under the surface, however, and in the summer, melt lakes scattered on top of the surface; there were also many polynyaps, leads and cracks. Because most of the water had been pumped or otherwise driven out of the permafrost, it had deep groundwater's purity, meaning it was nearly distilled: the Borealis was a freshwater ocean. It was expected to become

salty fairly soon, however, as rivers ran through the very salty regolith and carried their loads into the sea, then evaporated, precipitated, and repeated the process—moving salts from the regolith into the water until a balance was reached— a process which had the oceanographers transfixed with interest, for the saltiness of Earth’s oceans, stable for many millions of years, was not well understood.

The coastlines were wild. The polar island, formally nameless, was called variously the polar peninsula, or the polar island, or the Seahorse, for its shape on maps. In actuality its coastline was still overrun in many places by the ice of the old polar cap, and everywhere it was blanketed by snow, blown into patterns of giant sastrugi. This corrugated white surface extended out over the sea for many kilometers, until underwater currents fractured it and one came on a “coastline” of leads and pressure ridges and the chaotic edges of big tabular bergs, as well as larger and larger stretches of open water. Several large volcanic or meteoric islands rose up out of the shatter of this ice coast, including a few pedestal craters, sticking up out of the whiteness like great black tabular bergs.

The southern shores of the Borealis were much more exposed and various. Where the ice lapped against the foot of the Great Escarpment there were several mensae and colles regions that had become offshore archipelagoes, and these, as well as the mainland coastline proper, sported many beetling sea cliffs, bluffs, crater bays, fossa fjords, and long stretches of low smooth strand. The water in the two big southern gulfs was extensively melted below the surface, and, in the summers, on the surface as well. Chryse Gulf had perhaps the most dramatic coastline of all: eight big outbreak channels dropping into Chryse had partly filled with ice, and as it melted they were becoming steep-sided fjords. At the southern end of the gulf four of these fjords

braided, weaving together several big cliff-walled islands to make the most spectacular seascapes of all.

Over all this water great flocks of birds flew daily. Clouds bloomed in the air and rushed off on the wind, dappling the white and red with their shadows. Icebergs floated across the melted seas, and crashed against the shore. Storms dropped off the Great Escarpment with terrifying force, dashing hail and lightning onto the rock. There were now approximately forty thousand kilometers of coastline on Mars. And in the rapid freeze and thaw of the days and the seasons, under the brush of the constant wind, every part of it was coming alive.

When the congress ended Nadia made plans to get off Pavonis Mons immediately. She was sick of the bickering in the warehouse, of arguments, of politics; sick of violence and the threat of violence; sick of revolution, sabotage, the constitution, the elevator, Earth, and the threat of war. Earth and death, that was Pavonis Mons— Peacock Mountain, with all the peacocks preening and strutting and crying *Me Me Me*. It was the last place on Mars Nadia wanted to be.

She wanted to get off the mountain and breathe the open air. She wanted to work on tangible things; she wanted to build, with her nine fingers and her back and her mind, build anything and everything, not just structures, although those would be wonderful of course, but also things like air or dirt, parts of a construction project new to her, which was simply terraforming itself. Ever since her first walk in the open air down at DuMartheray Crater, free of everything but a little CO2 filter mask, Sax's obsession had finally made sense to her. She was ready to join him and the rest of them in that project, and more than ever now, as the removal of the orbiting mirrors had kicked off a long winter and threatened a full ice age. Build air, build dirt, move water, introduce plants and animals: all that kind of work sounded fascinating to her now. And of course the more conventional construction projects beckoned as well. When the new North Sea melted and its shoreline stabilized, there would be harbor towns to be inlaid everywhere, scores of them no doubt, each with jetties and seafronts, channels, wharves and docks, and the towns behind them rising into the hills. At the higher altitudes there would be more tent towns to be erected, and covered canyons. There was even talk of covering some of the big calderas, and of running cable cars between the three prince volcanoes, or bridging the narrows south of Elysium; there was talk of inhabiting the polar

island continent; there were new concepts in biohousing, plans to grow homes and buildings directly out of engineered trees, as Hiroko has used bamboo, but on a bigger scale. Yes, a builder ready to learn some of the latest techniques had a thousand years of lovely projects ahead of her. It was a dream come true.

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Then a small group came to her and said they were exploring possibilities for the first executive council of the new global government.

Nadia stared at them. She could see their import like a big slow-moving trap, and she tried her best to run out of it before it snapped shut. "There are lots of possibilities," she said. "About ten times more good people than council positions."

Yes, they said, looking thoughtful. But we were wondering if you had ever thought about it.

"No," she said.

Art was grinning, and seeing that she began to get worried. "I plan to build things," she said firmly.

"You could do that too," Art said. "The council is a part-time job."

"The hell it is."

"No, really."

It was true that the concept of citizen government was written everywhere into the new constitution, from the global legislature to the courts to the tents. People would

presumably do a good deal of this work part-time. Nadia was quite sure, however, that the executive council was not going to be in that category. "Don't executive council members have to be elected out of the legislature?" she asked.

Elected *by* the legislature, they told her happily. Usually fellow legislators would be elected, but not necessarily. "Well there's a mistake in the constitution for you!" Nadia said. "Good thing that you caught it so soon. Restrict it to elected legislators and you'll cut your pool way down—"

Way down—

"And still have lots of good people," she backpedaled.

But they were persistent. They kept coming back, in different combinations, and Nadia kept running toward that narrowing gap between the teeth of the trap. In the end they begged. A whole little delegation of them. This was *the* crucial time for the new government, they needed an executive council trusted by all, it would be the one to get things started, etc. etc. The senate had been elected, the duma had been drafted. Now the two houses were electing the seven executive council members. People mentioned as candidates included Mikhail, Zeyk, Peter, Marina, Etsu, Nanao, Ariadne, Marion, Irishka, Antar, Rashid, Jackie, Charlotte, the four ambassadors to Earth, and several others Nadia had first met in the warehouse. "*Lots* of good people," Nadia reminded them. This was the polycephalous revolution.

But people were uneasy at the list, they told Nadia repeatedly. They had become used to her providing a balanced center, both during the congress and during the revolution, and before that at Dorsa Brevia, and for that

matter throughout the underground years, and right back to the beginning. People wanted her on the council as a moderating influence, a calm head, a neutral party, etc. etc.

“Get out,” she said, suddenly angry, though she did not know why. They were concerned to see her anger, upset by it. “I’ll think about it,” she said as she shooed them out, to keep them moving.

Eventually only Charlotte and Art were left, looking serious, looking as if they had not conspired to bring all this about.

“They seem to want you on the executive council,” Art said.

“Oh shut up.”

“But they do. They want someone they can trust.”

“They want someone they’re not afraid of, you mean. They want an old babushka who won’t try to do anything, so they can keep their opponents off the council and pursue their own agendas.”

Art frowned; he had not considered this, he was too naive.

“You know a constitution is kind of like a blueprint,” Charlotte said thoughtfully. “Getting a real working government out of it is the true act of construction.”

“Out,” Nadia said.

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But in the end she agreed to stand. They were relentless, there were a surprisingly large number of them, and they would not give up. She didn’t want to seem like a shirker. And so she let the trap close down on her leg.

The legislatures met, the ballots were cast. Nadia was elected one of the seven, along with Zeyk, Ariadne, Marion, Peter, Mikhail, and Jackie. That same day Irishka was elected the first chief justice of the Global Environmental Court, a real coup for her personally and the Reds generally; this was part of the “grand gesture” Art had brokered at the congress’s end, to gain the Reds’ support. About half the new justices were Reds of one shade or another, making for a gesture just a bit too grand, in Nadia’s opinion.

Immediately after these elections another delegation came to her, led this time by her fellow councillors. She had gotten the highest ballot total in the two houses, they told her, and so the others wanted to elect her president of the council.

“Oh no,” she said.

They nodded gravely. The president was just another member of the council, they told her, one among equals. A ceremonial position only. This arm of the government was modeled on Switzerland’s, and the Swiss didn’t usually even know who their president was. And so on. Though of course they would need her permission (Jackie’s eyes glittered slightly at this), her acceptance of the post.

“Out,” she said.

After they had left Nadia sat slumped in her chair, feeling stunned.

“You’re the only one on Mars that everyone trusts,” Art said gently. He shrugged, as if to say he hadn’t been involved, which she knew was a lie. “What can you do?” he said, rolling his eyes with a child’s exaggerated theatricality. “Give it three years and then things’ll be on track, and you

can say you did your part and retire. Besides, the first president of Mars! How could you resist?"

"Easy."

Art waited. Nadia glared at him.

Finally he said, "But you'll do it anyway, right?"

"You'll help me?"

"Oh yes." He put a hand on her clenched fist. "All you want. I mean— I'm at your disposal."

"Is that an official Praxis position?"

"Why yes, I'm sure it could be. Praxis adviser to the Martian president? You bet."

So possibly she could make him do it.

She heaved a big sigh. Tried to feel less tight in her stomach. She could take the job, and then turn most of the work over to Art, and to whatever staff they gave her. She wouldn't be the first president to do that, nor the last.

"Praxis adviser to the Martian president," Art was announcing, looking pleased.

"Oh shut up!" she said.

"Of course."

He left her alone to get used to it, came back with a steaming pot of kava and two little cups. He poured; she took one from him, and sipped the bitter fluid.

He said, "Anyway I'm yours, Nadia. You know that."

“Mm-hmm.”

She regarded him as he slurped his kava. He meant it more than politically, she knew. He was fond of her. All that time working together, living together, traveling together; sharing space. And she liked him. A bear of a man, graceful on his feet, full of high spirits. Fond of kava, as was obvious in his slurping, in his squinched face. He had carried the whole congress, she felt, on the strength of those high spirits, spreading like an epidemic— the feeling that there was nothing so fun as writing a constitution— absurd! But it had worked. And during the congress they had become a kind of couple. Yes, she had to admit it.

But she was now 159 years old. Another absurdity, but it was true. And Art was, she wasn't sure, somewhere in his seventies or eighties, although he looked fifty, as they often did when they got the treatment early. “I'm old enough to be your great-grandmother,” she said.

Art shrugged, embarrassed. He knew what she was talking about. “I'm old enough to be that woman's great-grandfather,” he said, pointing at a tall native girl passing by their office door. “And she's old enough to have kids. So, you know. At some point it just doesn't matter.”

“Maybe not to you.”

“Well, yeah. But that's half of the opinions that count.”

Nadia said nothing.

“Look,” Art said, “we're going to live a long time. At some point the numbers have to stop mattering. I mean, I wasn't with you in the first years, but we've been together a long time now, and gone through a lot.”

“I know.” Nadia looked down at the table, remembering some of those times. There was the stump of her long-lost finger. All that life was gone. Now she was president of Mars. “Shit.”

Art slurped his kava, watched her sympathetically. He liked her, she liked him. They were already a kind of couple. “You help me with this damned council stuff!” she said, feeling bleak as all her technofantasies slipped away.

“Oh I will.”

“And then, well. We’ll see.”

“We’ll see,” he said, and smiled.

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So there she was, stuck on Pavonis Mons. The new government was assembling up there, moving from the warehouses into Sheffield proper, occupying the blocky polished stone-faced buildings abandoned by the metanats; there was an argument of course over whether they were going to be compensated for these buildings and the rest of their infrastructure, or whether it had all been “globalized” or “co-opted” by independence and the new order. “Compensate them,” Nadia growled at Charlotte, glowering. But it did not appear that the presidency of Mars was the kind of presidency that caused people to jump at her word.

In any case the government was moving in, Sheffield becoming, if not the capital, then at least the temporary seat of the global government. With Burroughs drowned and Sabishii burned, there was no other obvious place to put it, and in truth it didn’t look to Nadia like any of the other tent towns wanted to have it. People spoke of building a new capital city, but that would take time, and meanwhile they

had to meet somewhere. So around the piste to Sheffield they retired, inside its tent, under its dark sky. In the shadow of the elevator cable, rising from its eastern neighborhood straight and black, like a flaw in reality.

Nadia found an apartment in the westernmost tent, behind the rim park, up on the fourth floor where she had a fine view down into Pavonis's awesome caldera. Art took an apartment in the ground floor of the same building, at the back; apparently the caldera gave him vertigo. But there he was, and the Praxis office was in a nearby office building, a cube of polished jasper as big as a city block, lined with chrome blue windows.

Fine. She was there. Time to take a deep breath and do the work asked of her. It was like a bad dream in which the constitutional congress had suddenly been extended for three years, three m-years.

She began with the intention of getting off the mountain occasionally and joining some construction project or other. Of course she would perform her duties on the council, but working on an increase in greenhouse gas output, for instance, looked good, combining as it did technical problems and the politics of conforming to the new environmental regulatory regime. It would get her out into the back country, where a lot of the feedstocks for the greenhouse gases were located. From there she could do her council business over the wrist.

But events conspired to keep her in Sheffield. It was one thing after another— nothing particularly important or interesting, compared to the congress itself, but the details necessary to get things rolling. It was somewhat as Charlotte had said; after the design phase, the endless minutiae of construction. Detail after detail.

She had to expect this, she had to be patient. She would work through the first rush and then get away. In the meantime, along with the start-up process, the media wanted her, the new UN Martian Office wanted her, very interested in the new immigration policies and procedures; the other council members wanted her. Where would the council meet? How often? What were its rules of operation? Nadia convinced the other six councillors to hire Charlotte to be council secretary and protocol chief, and after that Charlotte hired a big crew of assistants from Dorsa Brevia. So they had the start of a staff. And Mikhail also had a great fund of practical experience in government from Bogdanov Vishniac. So there were people better suited than Nadia to do this work; but still she was called in a million times a day to confer, discuss, decide, appoint, adjudicate, arbitrate, administrate. It was endless.

And then when Nadia did clear time for herself, forcibly, it turned out that being president made it very difficult to join any particular project. Everything going on was now part of a tent or a co-op; very often they were commercial enterprises, involved in transactions that were part nonprofit public works, part competitive market. So to have the president of Mars join any given co-op would be a sign of official patronage, and couldn't be allowed if one wanted to be fair. It was a conflict of interest.

"Shit!" she said to Art, accusingly.

He shrugged, tried to pretend he hadn't known.

But there was no way out. She was a prisoner of power. She had to study the situation as if it were an engineering problem, like trying to exert force in some difficult medium. Say she wanted to build greenhouse-gas factories. She was constrained from joining any factory co-op in particular.

Therefore she had to do it some other way. Emergence at a higher level: she could perhaps coordinate co-ops.

There seemed to her good reasons to promote the building of greenhouse-gas factories. The Year Without Summer had extended to include a series of violent storms that had dropped off the Great Escarpment into the north, and most meteorologists agreed these “Hadley cross-equatorial storms” had been caused by the orbital mirrors’ removal, and the resulting sudden drop in insolation. A full ice age was deemed a distinct possibility; and pumping up greenhouse gases seemed to be one of the best ways to counter it. So Nadia asked Charlotte to initiate a conference to come back with recommendations for forestalling an ice age. Charlotte contacted people in Da Vinci and Sabishii and elsewhere, and soon she had a conference scheduled to take place in Sabishii, named, by some Da Vinci saxaclone no doubt, the “Insolation Loss Effects Abatement Meeting M-53.”

Nadia, however, never made it to this conference. She got caught up by affairs in Sheffield instead, mostly instituting the new economic system, which she thought important enough to keep her there. The legislature was passing the laws of eco-economics, fleshing out the bones drawn up in the constitution. They directed co-ops that had existed before the revolution to help the newly independent metanats local subsidiaries to transform themselves into similar cooperative organizations. This process, called horizontalization, had very wide support, especially from the young natives, and so it was proceeding fairly smoothly. Every Martian business now had to be owned by its employees only. No co-op could exceed one thousand people; larger enterprises had to be made of co-op associations, working together. For their internal structures most of the firms chose variants of the Bogdanovist models, which themselves were based on the cooperative Basque community of Mondragon, Spain. In these firms all employees were co-owners, and they bought into their positions by paying the equivalent of about a year's wages to the firm's equity fund, wages earned in apprentice programs of various kinds at the end of schooling. This buy-in fee became the starter of their share in the firm, which grew every year they stayed, until it was given back to them as pension or departure payment. Councils elected from the workforce hired management, usually from outside, and this management then had the power to make executive decisions, but was subject to a yearly review by the councils. Credit and capital were obtained from central cooperative banks, or the global government's start-up fund, or helper organizations such as Praxis and the Swiss. On the next level up, co-ops in the same industries or services were associating for larger projects, and also sending representatives to industry guilds, which established

professional practice boards, arbitration and mediation centers, and trade associations.

The economic commission was also establishing a Martian currency, for internal use and for exchanges with Terran currencies. The commission wanted a currency that was resistant to Terran speculation, but in the absence of a Martian stock market, the full force of Terran investment tended to fall on the currency itself, as the only investment game being offered. This tended to inflate the value of the Martian sequin in Terran money markets, and in the old days it would probably have blown the sequin's value right through the roof, to Mars's disadvantage in trade balances; but as the fracturing metanats continued to struggle against cooperativization back on Earth, Terran finance remained in some disarray, and did not have its old house-on-fire intensity. So the sequin ended up strong on Earth, but not too strong; and on Mars it was just money. Praxis was very helpful in this process, as they became a kind of federal bank for the new economy, providing interest-free loans and serving as a mediated exchange with Terran currencies.

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So given all this, the executive council was meeting for long hours every day to discuss legislation and other government programs. It was so time-consuming that Nadia almost forgot there was a conference she had initiated going on at the same time in Sabishii. On good nights, however, she spent a last hour or two on-screen with friends in Sabishii, and it looked like things were going fairly well there too. Many of Mars's environmental scientists were on hand, and they were in agreement that massively increasing greenhouse-gas emissions would ease the effects of the mirror loss. Of course CO₂ was the easiest greenhouse gas to emit, but even without using it— as they were still trying to reduce it in the

atmosphere to breathable levels— the consensus was that the more complex and powerful gases could be created and released in the quantities needed. And at first they did not think this would be a problem, politically; the constitution legislated an atmosphere no thicker than 350 millibars at the six-kilometer contour, but said nothing about what gases could be used to create this pressure. If the halocarbons and other greenhouse gases in the Russell cocktail were pumped out until they formed one hundred parts per million of the atmosphere, rather than the twenty-seven parts per million that were currently up there, then heat retention would rise by several degrees K, they calculated, and an ice age would be forestalled, or at least greatly shortened. So the plan called for production and release of tons of carbon tetrafluoride, hexafluoroethane, sulfur hexafluoride, methane, nitrous oxide, and trace elements of other chemicals which helped to decrease the rate at which UV radiation destroyed these halocarbons.

Completing the melting of the North Sea ice was the other obvious abatement strategy most often mentioned at the conference. Until it was all liquid, the albedo of the ice was bouncing a lot of energy back into space, and a truly lively water cycle was somewhat capped off. If they could get a liquid ocean, or, given how far north it was, a summer-liquid ocean, then any ice age would be done for, and terraformation essentially complete: they would have robust currents, waves, evaporation, clouds, precipitation, melting, streams, rivers, deltas— the full hydrological cycle. This was a primary goal, and so there was a variety of methods being proposed to speed the melting of the ice: feeding nuclear-power-plant exhaust heat into the ocean, scattering black algae on the ice, deploying microwave and ultrasound transmitters as heaters, even sailing big icebreakers through the shallow pack to aid the breakup.

Of course the increased greenhouse gases would help here as well; the ocean's surface ice would melt on its own, after all, as soon as the air stayed regularly above 273 K. But as the conference proceeded, more and more problems with the greenhouse-gas plan were being pointed out. It entailed another huge industrial effort, almost the equal of the metanot monster projects, like the nitrogen shipments from Titan, or the soletta itself. And it was not a onetime thing; the gases were constantly destroyed by UV radiation in the upper atmosphere, so they had to overproduce to reach the desired levels, and then continue producing for as long as they wanted the gases up there. Thus mining the raw materials, and constructing the factories to turn those materials into the desired gases, were enormous projects, and necessarily a largely robotic effort, with self-guided and replicating miners, self-building and regulating factories, upper-atmosphere sampler drones— an entire machine enterprise.

The technical challenge of this was not the issue; as Nadia pointed out to her friends at the conference, Martian technology had been highly robotic from the very beginning. In this case, thousands of small robotic cars would wander Mars on their own, looking for good deposits of carbon, sulfur, or fluorite, migrating from source to source like the old Arab mining caravans on the Great Escarpment; then when new feedstocks were found in high concentrations, the robots could settle down and construct little processing plants out of clay, iron, magnesium, and trace metals, providing the parts that could not be constructed on-site, and then assembling the whole. Fleets of automated diggers and carts would be manufactured to haul the processed material in to centralized factories, where the material would be gassified and released from tall mobile stacks. It wasn't that different from the earlier mining for atmospheric gases; just a larger effort.

But the most obvious deposits had already been mined, as people were now pointing out. And surface mining couldn't be done the way it used to be; there were plants growing almost everywhere now, and in many places a kind of desert pavement was developing on the surface, as a result of hydration, bacterial action, and chemical reactions in the clays. This crust helped greatly to cut down on dust storms, which were still a constant problem; so ripping it up to get to underlying deposits of feedstock materials was no longer acceptable, either ecologically or politically. Red members of the legislature were calling for a ban on just this kind of robotic surface mining, and for good reasons, even in terraforming terms.

It was hard, Nadia thought one night as she shut down her screen, to be faced with all the competing effects of their actions. The environmental issues were so tightly intertwined that it was hard to tease them out and decide what to do. And it was also hard to stay constrained by their own rules; individual organizations could no longer act unilaterally, because so many of their actions had global ramifications. Thus the necessity for environmental regulation, and for the global environmental court, already faced with a caseload running out of control. Eventually it would have to rule on any plans coming out of this conference as well. The days of unconstrained terraforming were gone.

And as a member of the executive council, Nadia was restricted to saying that she thought increased greenhouse gases were a good idea. Other than that she had to stay out, or appear to be impinging on the environmental court's territory; which Irishka was defending very vigorously. So Nadia spent time visiting on-screen with a group designing new robot miners that would minimally disrupt the surface, or talking to a group working on dust fixatives that might be

sprayed or grown over the surface, “thin fast pavements” as they called them; but they were proving to be a knotty problem.

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And that was the extent of Nadia’s participation in the Sabishii conference that she herself had initiated. And since all its technical problems were enmeshed in political considerations anyway, it might have been said that she hadn’t missed it at all. Not a bit of real work had been done there, by her or anyone else. Meanwhile, back in Sheffield, the council was facing any number of problems of its own: unforeseen difficulties in instituting the eco-economy; complaints that the GEC was overstepping its authority; complaints about the new police, and the criminal justice system; unruly and stupid behavior in both houses of the legislature; Red and other types of resistance in the outback; and so on. The issues were endless, and spanned the gamut from the profoundly important to the incredibly petty, until Nadia began to lose all sense of where on that continuum any individual problem lay.

For instance, she spent a good deal of her time involved in the council’s own internal struggles, which she considered trivial, but couldn’t avoid. Most of these struggles involved resisting Jackie’s efforts to put together a majority that would vote with Jackie every time, so that Jackie could use the council as a rubber stamp for the Free Mars party line, or in other words for Jackie herself. This meant getting to know the rest of the councillors better, and figuring out how to work with them. Zeyk was an old acquaintance; Nadia liked him, and he was a power among the Arabs, their current representative to the general culture, having defeated Antar for that position; gracious, smart, kind, he was in agreement with Nadia on many issues, including the core ones, and this

made it an easy relationship, even a growing friendship. Ariadne was one of the goddesses of the Dorsa Brevian matriarchy, and acted the part to a tee: imperious and rigid in her principles, she was an ideologue, probably the only thing that kept her from being a serious challenge to Jackie's prominence among the natives. Marion was the Red councillor, an ideologue also, but much changed from her early radical days, although still a long-winded arguer, not easily beaten. Peter, Ann's little boy, had grown up to be a power in several different parts of Martian society, including the space crew at Da Vinci, the green underground, the cable crowd, and to an extent, because of Ann, the more moderate Reds. This versatility was part of his nature, and Nadia had a hard time getting a fix on him; he was private, like his parents, and seemed wary of Nadia and the rest of the First Hundred; he wanted a distance from them, he was nisei through and through. Mikhail Yangel was one of the earliest issei to follow the First Hundred to Mars, and had worked with Arkady from very early on. He had helped to start the revolt of 2061, and Nadia's impression was that he had been one of the most extreme Reds at that time— which fact sometimes made her angry at him still, which was silly, and impeded her ability to talk to him— but there it was, despite the fact that he too was much changed, a Bogdanovist willing to compromise. His presence on the council was a surprise to Nadia— a gesture toward Arkady, one might say, which she found touching.

And then there was Jackie, very possibly the most popular and powerful politician on Mars. At least until Nirgal got back.

And so Nadia dealt with these six every day, learning their ways as they made their way through item after item on their daily agendas. From the important to the trivial, the abstract to the personal— everything seemed to Nadia part

of a fabric, where everything connected to everything. Not only was the council not part-time work, it ate up the entirety of every waking day. It consumed her life. And yet at this point she had only gotten through two months of a three-m-year term.

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Art could see that it was getting to her, and he did what he could to help. He came up to her apartment every morning with breakfast, like room service. Often he had cooked it himself, and always it was good. As he came in, platter held aloft, he called up jazz on her AI to serve as the soundtrack of their morning together— not just Nadia’s beloved Louis, though he sought out odd recordings by Satch to amuse her, things like “Give Peace a Chance” or “Stardust Memories”— but also later styles of jazz that she had never liked before, because they were so frenetic; but that seemed to be the tempo of these days. Whatever the reason, Charlie Parker now skittered and zoomed around most impressively, she thought, and Charles Mingus made his big band sound like Duke Ellington’s on pandorph, which was just what Ellington and all the rest of swing needed, in her opinion— very funny, lovely music. And best of all, on many mornings Art called up Clifford Brown, a discovery Art had made during his investigations on her behalf, one he was very proud of, and advocated constantly to her as the logical successor to Armstrong— a vibrant trumpet sound joyous and positive and melodic like Satch, and also brilliantly fast and clever and difficult— like Parker, only happy. It was the perfect soundtrack for these wild times, driving and intense but as positive as one could be.

So Art would bring in breakfasts, singing “All of Me” in a pretty good voice, and with Satchmo’s basic insight that American song lyrics could only be treated as silly jokes: “All

of me, why not take all of me, Can't you see, I'm no good without you." And call up some music, and sit with his back to the window; and the mornings were fun.

But no matter how well the days began, the council was eating her life. Nadia got more and more sick of it— the bickering, negotiating, compromising, conciliating— the dealing with people, minute after minute. She was beginning to hate it.

Art saw this, of course, and began to look worried. And one day after work he brought over Ursula and Vlad. The four of them had dinner together in her apartment, Art cooking. Nadia enjoyed her old friends' company; they were in town on business, but getting them over for dinner there had been Art's idea, and a good one. He was a sweet man, Nadia thought as she watched him moving about the kitchen. Canny diplomat as guileless simpleton, or vice versa. Like a benign Frank. Or a mix of Frank's skill and Arkady's happiness. She laughed at herself, always thinking of people in terms of the First Hundred— as if everyone was somehow a recombination of the traits of that original family. It was a bad habit of hers.

Vlad and Art were talking about Ann. Sax had apparently called Vlad from the shuttle rocket on its return to Mars, shaken by a conversation with Ann. He was wondering if Vlad and Ursula would consider offering Ann the same brain plasticity treatment that they had given him after his stroke.

"Ann would never do it," Ursula said.

"I'm glad she won't," Vlad said. "That would be too much. Her brain wasn't injured. We don't know what that treatment would do in a healthy brain. And you should only undertake what you can understand, unless you are desperate."

“Maybe Ann is desperate,” Nadia said.

“No. Sax is desperate.” Vlad smiled briefly. “He wants a different Ann before he gets back.”

Ursula said to him, “You didn’t want Sax to try that treatment either.”

“It’s true. I wouldn’t have done it to myself. But Sax is a bold man. An impulsive man.” Now Vlad looked at Nadia: “We should stick to things like your finger, Nadia. Now that we can fix.”

Surprised, Nadia said, “What’s wrong with it?”

They laughed at her. “The one that’s missing!” Ursula said. “We could grow it back, if you wanted.”

“Ka,” Nadia exclaimed. She sat back, looked at her thin left hand, the stump of the missing little finger. “Well. I don’t need it, really.”

They laughed again. “You could have fooled us,” Ursula said. “You’re always complaining about it when you’re working.”

“I am?”

They all nodded.

“It’ll help your swimming,” Ursula said.

“I don’t swim much anymore.”

“Maybe you stopped because of your hand.”

Nadia stared at it again. “Ka. I don’t know what to say. Are you sure it will work?”

“It might grow into an entire other hand,” Art suggested. “Then into another Nadia. You’ll be a Siamese twin.”

Nadia pushed him sideways in his chair. Ursula was shaking her head. “No no. We’ve done it for some other amputees already, and a great number of experimental animals. Hands, arms, legs. We learned it from frogs. Quite wonderful, really. The cells differentiate just like the first time the finger grew.”

“A very literal demonstration of emergence theory,” Vlad said with a small smile. Nadia saw by that smile that he had been instrumental in designing the procedure.

“It works?” she asked him directly.

“It works. We make what is in effect a new finger bud over your stump. It’s a combination of embryonic stem cells with some cells from the base of your other little finger. The combination functions as the equivalent of the homeobox genes you had when you were a fetus. So you’ve got the developmental determiners there to make the new stem cells differentiate properly. Then you ultrasonically inject a weekly dose of fibroblast growth factor, plus a few cells from the knuckle and the nail, at the appropriate times . . . and it works.”

As he explained Nadia felt a little glow of interest spread through her. A whole person. Art was watching her with his friendly curiosity.

“Well, sure,” she said at last. “Why not.”

So in the following week they took some biopsies from her remaining little finger, and gave her some ultrasonic shots in the stump of the missing finger, and in her arm, and gave

her some pills; and that was it. After that it was only a matter of weekly shots, and waiting.

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Then she forgot about it, because Charlotte called with a problem; Cairo was ignoring a GEC order concerning water pumping. “You’d better come check it out in person. I think the Cairenes are testing the court, for a faction of Free Mars that wants to challenge the global government.”

“Jackie?” Nadia said.

“I think so.”

Cairo stood on its plateau edge, overlooking the northwestern-most U-valley of Noctis Labyrinthus. Nadia walked out of the train station with Art onto a plaza flanked by tall palm trees. She glared at the scene; some of the worst moments of her life had occurred in this city, during the assault on it in 2061. Sasha had been killed, among many others, and Nadia had blown up Phobos, she herself!—and all just a few days after finding Arkady's burned remains. She had never returned; she hated this town.

Now she saw that it had been damaged again in the recent unrest. Parts of the tent had been blown, and the physical plant heavily damaged. It was being rebuilt, and new tent segments were being tacked onto the old town, extending west and east far along the plateau's edge. It looked like a boomtown, which Nadia found peculiar given its altitude, ten kilometers above the datum. They would never be able to take down the tents, or go outside without walkers on, and so Nadia had assumed it would therefore go into decline. But it lay at the intersection of the equatorial piste and the Tharsis piste running north and south, the last place one could cross the equator between here and the chaoses, a full quarter of the planet away. So unless a Transmarineris bridge were built somewhere, Cairo would always be at a strategic crossroads.

And crossroads or not, they wanted more water. The Compton Aquifer, underlying lower Noctis and upper Marineris, had been breached in '61, and its water had poured down the entire length of the Marineris canyons. This was the flood that had almost killed Nadia and her companions during the flight down the canyons, after Cairo was taken. Most of the floodwater had either frozen in the canyons, creating a long irregular glacier, or had pooled and frozen in the chaoses at the bottom of Marineris. And some

water had of course remained in the aquifer. In the years since, the water in the aquifer had been pumped out for use in cities all over east Tharsis. And the Marineris Glacier had slowly dropped down canyon, receding at its upper end where there was no source to replenish it, leaving behind only devastated land and a string of very shallow ice lakes. Cairo was therefore running out of a ready supply of water. Its hydrology office had responded by laying a pipeline to the northern sea's big southern arm in the Chryse depression, and pumping water up to Cairo. So far, no problem; every tent town got its water from somewhere. But the Cairenes had lately started pouring water into a reservoir in the Noctis canyon under them, and letting a stream out from this reservoir to run down into Ius Chasma, where eventually it pooled behind the upper end of the Marineris Glacier, or ran by it. Essentially they had created a new river running right down the big canyon system, far away from their town; and now they were establishing a number of riverside settlements and farming communities downstream from the city. A Red legal group had gone to the Global Environmental Court to challenge this action, asserting that Valles Marineris had legal consideration as a natural wonder, being the largest canyon in the solar system; if left alone the breakout glacier would eventually have slid down into the chaos, leaving the canyons again open-floored. This was what they thought should happen, and the GEC had agreed with them, and issued an order (Charlotte called this a "gecko") against Cairo, requiring them to halt the release of water out of the town reservoir. Cairo had refused to desist, claiming that the global government had no jurisdiction over what they called "vital town life-support issues." Meanwhile building new downstream settlements as fast as they could.

Clearly it was a provocation, a challenge to the new system. "This is a test," Art muttered as they walked across the

plaza, “this is only a test. If this were a true constitutional crisis, you would hear a beep all over the planet.”

A test; exactly the kind of thing for which Nadia had lost all patience. So she crossed the city in a foul mood. No doubt it did not help that the awful days of ‘61 were called back so vividly to mind by the plaza, the boulevards, the city wall at the canyon rim, all just as they had been back then. They said one’s memory was weakest from one’s middle years, but she would have lost those memories happily if she could have; fear and rage, however, seemed to function as some kind of nightmare fixative. For it was all still there— Frank tapping madly away at his monitors, Sasha eating pizza, Maya shouting angrily at something or other, the fraught hours of waiting to see if they would be passed over by the falling pieces of Phobos. Seeing Sasha’s body, bloody at the ears. Clicking over the transmitter that had brought Phobos down.

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Thus it was very hard to keep her irritation in check as she went into the first meeting with the Cairenes, and found Jackie there among them, supporting their position. Jackie was pregnant now as well, and had been for some time; she was flushed, glossy, beautiful. No one knew who the father was, it was something she was doing on her own. A Dorsa Brevia tradition, by way of Hiroko— and just one more irritant to Nadia.

The meeting took place in a building next to the city wall, overlooking the U-shaped canyon below, called Nilus Noctis. The water in dispute was actually visible downcanyon, a broad ice-sheeted reservoir stopped by a dam not visible from up here, stopped just before the Illyrian Gate and the new chaos of the Compton Break.

Charlotte stood with her back to the window, asking the Cairene officials just the questions Nadia would have asked, but without the slightest trace of Nadia's annoyance. "You will always be in a tent. Opportunities for growth will be limited. Why flood Marineris when you won't benefit from it?"

No one seemed to care to answer this. Finally Jackie said, "The people living down there will benefit, and they're part of greater Cairo. Water in any form is a resource at these altitudes."

"Water running freely down Marineris is no resource at all," Charlotte said.

The Cairenes argued for the utility of water in Marineris. There were also representatives of the downstream settlers, many of them Egyptians, claiming that they had been in Marineris for generations, that it was their right to live there, that it was the best farming land on Mars, that they would fight before they would leave, and so on. Sometimes the Cairenes and Jackie seemed to be defending these neighbors, at other times their own right to use Marineris as a reservoir. Mostly they seemed to be defending their right to do whatever they wanted. Slowly Nadia got angrier and angrier.

"The court made its judgment," she said. "We're not here to argue it again. We're here to see it enacted." And she left the meeting before she said anything inexcusable.

That night she sat with Charlotte and Art, so irritated that she could not focus on a delicious Ethiopian meal in the train-station restaurant. "What do they want?" she asked Charlotte.

Charlotte shrugged, mouth full. After swallowing: "Have you been noticing that being president of Mars is not a particularly powerful position?"

"Hell yes. It would be hard to miss."

"Yes. Well, the whole executive council is the same, of course. It's looking like the real power in this government is in the environmental court. Irishka was put in charge there as part of the grand gesture, and she's done a lot to legitimate moderate redness by staking out a middle ground. It allows for a lot of development under the six-k limit, but above that, they're very strict. That's all backed by the constitution, so they've been able to make everything stand—the legislature is laying off, they haven't overturned any judgments yet. So it's been an impressive first session for Irishka and that whole group of justices."

"So Jackie is jealous," Nadia said.

Charlotte shrugged. "It's possible."

"More than possible," Nadia said grimly.

"And then there's the matter of the council itself. Jackie may think this is something she can get three of the others to back her on, and then the council becomes that much more hers. Cairo is an arena where she might hope that Zeyk will vote with her because of the Arab part of town. Then only two more. And both Mikhail and Ariadne are strong localists."

"But the council can't overturn court decisions," Nadia said, "only the legislature, right? By legislating new laws."

"Right, but if Cairo continues to defy the court, then it would be up to the council to order the police to go down there and

physically stop them. That's what the executive branch is supposed to do. If the council didn't do that, then the court would be undermined, and Jackie would take effective control of the council. Two birds with one stone."

Nadia threw down her bit of spongy bread. "I'll be damned if that happens," she said.

They sat in silence.

"I hate this stuff," Nadia said.

Charlotte said, "In a few years there will be a body of practices, institutions, laws, amendments to the constitution, all that. Things that the constitution never addressed, which translate it into action. Like the proper role of political parties. Right now we're in the process of working all these things out."

"Maybe so, but I still hate it."

"Think of it as meta-architecture. Building the culture that allows architecture to exist. Then it'll be less frustrating for you."

Nadia snorted.

"This one should be a clear case," Charlotte said. "The judgment has been made, they only have to abide by it."

"What if they don't?"

"Time for the police."

"Civil war, in other words!"

"They won't push it that far. They signed the constitution just like everyone else, and if everyone else is abiding by it,

then they become outlaws, like the Red ecoteurs. I don't think they'll go that far. They're just testing the limits."

She did not seem annoyed by this. That was the way people were, her expression seemed to say. She did not blame anyone, she was not frustrated. A very calm woman, this Charlotte— relaxed, confident, capable. With her coordinating it, the executive council's work had so far been well organized, if not easy. If that competence was what growing up in a matriarchy like Dorsa Brevia did for you, Nadia thought, then more power to them. She couldn't help but compare Charlotte to Maya, with all Maya's mood shifts, her angst and self-dramatization. Well, it was probably an individual thing in any culture. But it was going to be interesting to have more Dorsa Brevia women around to take on these jobs.

At the next morning's meeting Nadia stood and said, "An order against dumping water in Marineris has been issued already. If you persist in the dumping, the new police powers of the global community will be exerted. I don't think anyone wants that."

"I don't think you can speak for the executive council," Jackie said.

"I can," Nadia said shortly.

"No you can't," Jackie said. "You're only one of seven. And this isn't a council matter anyway."

"We'll see about that," Nadia said.

The meeting dragged on. The Cairenes were stonewalling. The more Nadia understood what they were doing the less she liked it. Their leaders were important in Free Mars; and even if this challenge failed, it might result in concessions to

Free Mars in other areas; so the party would have gained more power. Charlotte agreed that this could be their ultimate motive. The cynicism of this disgusted Nadia, and she found it very hard to be civil to Jackie when Jackie spoke to her, with her easy cheerfulness, the pregnant queen cruising around among her minions like a battleship among rowboats: "Aunt Nadia, so sorry you felt you needed to take time for such a thing as this. . . ."

That night Nadia said to Charlotte, "I want a ruling where Free Mars gets nothing at all out of this."

Charlotte laughed briefly. "Been talking to Jackie, have you?"

"Yes. Why is she so popular? I don't understand it, but she is!"

"She's nice to a lot of people. She thinks she's nice to everyone."

"She reminds me of Phyllis," Nadia said. The First Hundred again. . . . "Maybe not. Anyway, isn't there some sort of penalty we can invoke against frivolous suits and challenges?"

"Court costs, in some cases."

"See if you can lay that on her then."

"First let's see if we can win."

The meetings went on for another week. Nadia left the talking to Charlotte and Art. She spent the meetings looking out the windows at the canyon below, and in rubbing the stump of her finger, which now had a noticeable new bump on it. So strange; despite paying close attention, she could

not recall when the bump had first appeared. It was warm and pink, a delicate pink, like a child's lips. There seemed to be a bone in the middle of it; she was afraid to squeeze it very hard. Surely lobsters didn't pinch their returning limbs. All that cell proliferation was disturbing— like a cancer, only controlled, directed— the miracle of DNA's instructional abilities made manifest. Life itself, flourishing in all its emergent complexity. And a little finger was nothing compared to an eye, or an embryo. It was a strange business.

With that going on, the political meetings looked really dreadful. Nadia walked out of one having heard almost none of it, though she was sure nothing significant had happened, and she went for a long walk, out to an overlook bulging out of the western end of the tent wall. She called Sax. The four travelers were getting closer to Mars; transmission delays were down to a few minutes. Nirgal appeared to be healthy again. He was in good spirits. Michel actually looked more drained than Nirgal; it seemed that the visit to Earth had been hard on him. Nadia held up her finger to the screen to cheer him up, and it worked.

"A pinky, don't they call it that?"

"I guess so."

"You don't seem to believe it's going to work."

"No. I guess I don't."

"We're in a transitional period, I think," Michel said. "At our age we can't really believe that we're still alive, so we act as if it will end at any minute."

"Which it could." Thinking of Simon. Or Tatiana Durova. Or Arkady.

“Of course. But then again it might go on for decades more, or even centuries. After a while we’ll have to start believing in it.” He sounded like he was trying to convince himself as much as her. “You’ll look at your whole hand and then you’ll believe it. And that will be very interesting.”

Nadia wiggled the pink nub at the end of her hand. No fingerprint yet in the fresh translucent skin. No doubt when it came it would be the same fingerprint as the one on the other little finger. Very strange.

Art came back from one meeting looking concerned. “I’ve been asking around about this,” he said, “trying to figure out why they’re doing it. I put some Praxis operatives on the case, down in the canyon and back on Earth, and inside the Free Mars leadership.”

Spies, Nadia thought. Now we have spies.

“— appears that they are making private arrangements with Terran governments concerning immigration. Building settlements and giving places to people from Egypt, definitely, and probably China too. It’s got to be a quid pro quo, but we don’t know what they’re getting in return from these countries. Money, possibly.”

Nadia growled.

In the next couple of days she met on-screen or in person with all the other members of the executive council. Marion was of course against pumping any more water into Marineris, and so Nadia needed only two more votes. But Mikhail and Ariadne and Peter were unwilling to bring the police to bear if it could be avoided in any other way; and Nadia suspected they were not much happier than Jackie at the relative weakness of the council. They seemed willing to

make concessions, to avoid an awkward enforcement of a court judgment they weren't adamantly behind.

Zeyk clearly wanted to vote against Jackie, but felt constrained by the Arab constituency in Cairo, and the eyes of the Arab community on him; control of land and water were both important to them. But the Bedouin were nomadic, and besides, Zeyk was a strong supporter of the constitution. Nadia thought he would support her. That left one more to be convinced.

The relationship with Mikhail had never improved, it was as if he wanted to be closer to Arkady's memory than she was. Peter she didn't feel she understood. Ariadne she didn't like, but in a way that made it easier; and Ariadne had come to Cairo as well. So Nadia decided to work on her first.

Ariadne was as committed to the constitution as most of the Dorsa Brevians, but they were localists as well, and were no doubt thinking about keeping some independence of their own from the global government. And they too were far from any water supply. So Ariadne had been wavering.

"Look," Nadia said to her in a little room across the plaza from the city offices, "You've got to forget about Dorsa Brevia and think about Mars."

"I am, of course."

She was irritated that this meeting was taking place; she would rather have dismissed Nadia out of hand. The merits of the case weren't what mattered to her, it was just a matter of precedence, of not having to listen to any issei. It was power politics and hierarchy to these people now, they had forgotten the real issues involved. And in this damned city; suddenly Nadia lost her patience, and she almost shouted, "You're not! You're not thinking at all! This is the

first challenge to the constitution, and you're looking around for what you can get out of it! I won't have it!" She waved a finger under Ariadne's surprised face: "If you don't vote to enforce the court ruling, then the next time something you really want comes up for a council vote you'll see reprisals, *from me*. Do you understand?"

Ariadne's eyes were like billboards: first shocked, then a moment of pure fear. Then anger. She said, "I never said I wasn't going to vote for enforcement! What are you going ballistic for?"

Nadia returned to a more ordinary argument mode, although still hard and tense and unrelenting. Finally Ariadne threw up her hands: "It's what most of the Dorsa Brevia council wants to do, I was going to vote for it anyway. You don't have to be so *frantic* about it." And she hurried out of the room, very upset.

First Nadia felt a surge of triumph. But that look of fear in the young woman's eyes— it stuck with her, until she began to feel slightly sick to her stomach. She remembered Coyote on Pavonis, saying "Power corrupts." That was the sick feeling— that first hit of power used, or misused.

Much later that night she was still sick with repulsion, and almost weeping, she told Art about the confrontation. "That sounds bad," he said gravely. "That sounds like a mistake. You still have to deal with her. When that's the case, you have to just tweak people."

"I know I know. *God* I hate this," she said. "I want to get away, I want to do something *real*."

He nodded heavily, patted her shoulder.

Before the next meeting, Nadia went over to Jackie and told her quietly that she had the council votes to put police down at the dam to stop any further release of water. Then in the meeting itself, she reminded everyone in an offhand remark that Nirgal would be back among them very soon, along with Maya and Sax and Michel. This caused several of the Free Mars group on hand to look thoughtful, though Jackie of course showed no reaction. As they nattered on after that, Nadia rubbed her finger, distracted, still upset with herself about the meeting with Ariadne.

The next day the Cairenes agreed to accept the judgment of the Global Environmental Court. They would cease releasing water from their reservoir, and the settlements downcanyon would have to exist on piped water, which would certainly pinch their growth.

“Good,” Nadia said, still bitter. “All that just to obey the law.”

“They’re going to appeal,” Art pointed out.

“I don’t care. They’re done for. And even if they aren’t, they’ve submitted to the process. Hell, they can win for all I care. It’s the process that counts, so we win no matter what.”

Art smiled to hear this. A step in her political education, no doubt, a step Art and Charlotte seemed to have taken long ago. What mattered to them was not the result of any single disagreement, but the successful use of the process. If Free Mars represented the majority now— and apparently it did, as it had the allegiance of almost all the natives, young fools that they were— then submitting to the constitution meant that they could not simply push around minority groups by force of numbers. So when Free Mars won something, it would have to be on the merits of the case, judged by the full array of court justices, who came from all factions. That

was quite satisfying, actually; like seeing a wall made of delicate materials bear more weight than it looked like it could, because of a cleverly built framework.

But she had used threats to shore up one beam, and so the whole thing left a bad taste in her mouth. “I want to do something real.”

“Like plumbing?”

She nodded, not even close to a smile. “Yes. Hydrology.”

“Can I come along?”

“Be a plumber’s helper?”

He laughed. “I’ve done it before.”

Nadia regarded him. He was making her feel better. It was peculiar, old-fashioned: to go somewhere just to be with someone. It didn’t happen much anymore. People went where they needed to go, and hung out with whatever friends they found there, or made new friends. It was the Martian way. Or maybe just the First Hundred’s way. Or her way.

Anyway, it was clear that doing this, traveling together, was more than just a friendship, more even perhaps than an affair. But that was not so bad, she decided. In fact not bad at all. Something to get used to, perhaps. But there was always something to get used to.

A new finger, for instance. Art was holding her hand, lightly massaging the new digit. “Does it hurt? Can you bend it?”

It did hurt, a little; and she could bend it, a little. They had injected some knuckle zone cells, and now it was just longer

than the first joint of her other little finger, the skin still baby pink, unmarred by callus or scar. Every day a little bigger.

Art squeezed the tip of it ever so gently, feeling the bone inside. His eyes were round. "You can feel that?"

"Oh yes. It's like the other fingers, only a bit more sensitive maybe."

"Because it's new."

"I suppose."

Only the old lost finger was implicated, somehow; the ghost was calling again, now that there were signals coming from that end of the hand. The finger in the brain, Art called it. And no doubt there really was a cluster of brain cells devoted to that finger, which had been the ghost all along. It had faded over the years from lack of stimulus, but now it too was growing back, or being restimulated or reinforced; Vlad's explanations of the phenomenon were complex. But these days when she felt the finger, it sometimes felt just as large as the one on the other hand, even when she was looking right at it. Like feeling an invisible shell over the new one. Other times she felt the little thing at its proper size, short and skinny and weak. She could bend it at the hand knuckle, and just a little at the middle knuckle. The last kuckle, behind the fingernail, wasn't there yet. But it was on its way. Growing. Again Nadia joked about it growing on and on, though it was a creepy thought. "That would be good," Art said. "You'd have to get a dog."

But now she felt confident that wouldn't happen. The finger seemed to know what it was doing. It would be all right. It looked normal. Art was fascinated by it. But not just by it. He massaged her hand, which was a bit sore, and then her arm

and shoulders too. He would massage all of her if she let him. And judging by how her finger and arm and shoulders felt, she certainly ought to. He was so relaxed. Life for him was still a daily adventure, full of marvels and hilarity. People made him laugh every day; that was a great gift. Big, round-faced, round-bodied, somewhat like Nadia herself in certain aspects of appearance; balding, unpretentious, graceful on his feet. Her friend.

Well, she loved Art, of course. She had since Dorsa Brevia at least. Something like her feeling for Nirgal, who was a most beloved nephew or student or godchild or grandchild or child; and Art, therefore, one of her child's friends. Actually he was a bit older than Nirgal, but still, those two were like brothers. That was the problem. But all these calculations were being progressively thrown off by their increasing longevity. When he was only five percent younger than her, would it matter anymore? When they had gone through thirty years of intense experience together, as they already had, as equals and collaborators, architects of a proclamation, a constitution, and a government; close friends, confidants, helpers, massage partners; did it matter, the different number of years past their youths they were? No it did not. It was obvious, one only had to think about it. And then try to feel it too.

They didn't need her in Cairo anymore, they didn't need her in Sheffield right that second. Nirgal would be back soon, and he would help to keep Jackie in check; not a fun job, but that was his problem, no one could help him there. It was hard when you fixed all your love on one person. As she had with Arkady, for so many years, even though he had been dead for most of them. It made no sense; but she missed him. And she still got angry at him. He had not even lived long enough to realize how much he had missed. The happy fool. Art was happy too, but he was no fool. Or not much. To

Nadia all happy people were a bit foolish by definition, otherwise how could they be so happy? But she liked them anyway, she needed them. They were like her beloved Satchmo's music; and given the world, and all that it held, that happiness was a very courageous way to live— not a set of circumstances, but a set of attitudes. "Yes, come plumbing with me," she said to Art, and hugged him hard, hard, as if you could capture happiness by squeezing it hard enough. She pulled back and he was bug-eyed with surprise, as when holding her little finger.

But she was still president of the executive council, and despite her resolve, every day they bound her to the job a little more tightly, with “developments” of all kinds. German immigrants wanted to build a new harbor town called Blochs Hoffnung on the peninsula that cut the North Sea in half, and then dig a broad canal through the peninsula. Red ecoteurs objected to this plan, and blew up the piste running down the peninsula. They blew up the piste leading to the top of Biblis Patera as well, to indicate they objected to that as well. Ecopoets in Amazonia wanted to start massive forest fires. Other ecopoets in Kasei wanted to remove the fire-dependent forest that Sax had planted in the great curve of the valley (this petition was the first to receive unanimous approval from the GEC). Reds living around White Rock, an eighteen-kilometer-wide pure white mesa, wanted it declared a “kami site” forbidden to human access. A Sabishii design team was recommending that they build a new capital city on the North-Sea coast at 0 longitude, where there was a deep bay. New Clarke was getting crowded with what looked suspiciously like metanat security snoopertroopers. The Da Vinci techs wanted to give control of Martian space over to an agency of the global government that didn’t exist. Senzeni Na wanted to fill their mohole. The Chinese were requesting permission to build an entirely new space elevator tethered near Schiaparelli Crater, to accommodate their own emigration, and contract out to others. Immigration was growing every month.

Nadia dealt with all these issues in half-hour increments scheduled by Art, and so the days passed in a blur. It got very difficult to stay aware that some of these matters were much more important than others. The Chinese, for instance, would flood Mars with immigrants if they got half a chance . . . and the Red ecoteurs were getting more

outrageous; there had even been death threats made against Nadia herself. She now had escorts when she left her apartment, and the apartment was discreetly guarded. Nadia ignored that, and continued to work on the issues, and to work the council to keep a majority on her side in the votes that mattered to her. She established good working relations with Zeyk and Mikhail, and even with Marion. Things never went quite right with Ariadne again, however, which was a lesson learned twice; but learned well because of that.

So she did the job. But all the time she wanted off Pavonis. Art saw her patience get shorter by the day; she knew by his look that she was becoming crochety, crabby, dictatorial; she knew it, but could not help it. After meetings with frivolous or obstructionist people she often unleashed a torrent of vicious abuse, in a steady low cursing voice that Art obviously found unnerving. Delegations would come in demanding an end to the death penalty, or the right to build in the Olympus Mons caldera, or a free eighth spot on the executive council, and as soon as the door closed Nadia would say, “Well *there’s* a bunch of fucking idiots for you, *stupid* fools never even thought about tie votes, never occurred to them that taking someone else’s life abrogates your own right to live,” and so on. The new police captured a group of Red ecoteurs who had tried to blow up the Socket again, and in the process killed a security guard out of his position, and she was the hardest judge they had: “Execute them!” she exclaimed. “Look, you kill someone, you lose your *right* to live. Execute them or else exile them from Mars for life— make them pay in a way that really gets the rest of the Reds’ attention.”

“Well,” Art said uneasily. “Well, after all.” But on she raged. She couldn’t stop until she felt less angry. And Art could see that it was getting harder every time.

Flailing a bit himself, he recommended she start another conference, like the one in Sabishii she had missed; and make sure she made this one. Organizing the efforts of different organizations for a single cause; this was not really building, Nadia thought, but it looked like it would have to do.

The fight in Cairo had gotten her thinking about the hydrological cycle, and what would happen when the ice began to melt. If they could set up some kind of plan for a water cycle, even only an approximation, then it might go far toward reducing conflicts over water. So she decided to see what could be done.

As often happened these days when she thought about global issues, she found herself wanting to talk to Sax about it. The travelers to Earth were almost back now, close enough that transmission delay was insignificant, it was almost like having a normal wrist conversation. So Nadia spent evenings talking with Sax about terraforming. More than once he surprised her utterly; he did not hold the opinions she had imagined he would hold, he seemed always to be changing. "I want to keep things wild," he said one night.

"What do you mean?" she asked.

His face took on the puzzled expression it wore when he was thinking hard. It was considerably longer than the transmission delay before he replied: "Many things. It's a complicated word. But— I mean— I want to maintain the primal landscape, as much as possible."

Nadia could censor out her laughter at this; but still Sax said, "What do you find amusing?"

“Oh nothing. It’s just you sound like, I don’t know, like some of the Reds. Or the people in Christianopolis, they’re not Reds, but they said almost the same thing to me, last week. They want to keep the primal landscape of the far south preserved. I’ve helped them to set up a conference to talk about southern watersheds.”

“I thought you were working on greenhouse gases?”

“They won’t let me work, I have to be president. But I am going to go to this conference.”

“Good idea.”

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The Japanese settlers in Messhi Hoko (which meant “self-sacrifice for the sake of the group”) came to the council to demand that more land and water be dedicated to their tent high on south Tharsis. Nadia walked out on them, and flew with Art down to Christianopolis, in the far south.

The little town (and it seemed very little after Sheffield and Cairo) was set in Phillips Rim Crater Four, at latitude sixty-seven degrees south. During the Year Without Summer the far south had experienced many severe storms, dropping about four meters of new snow, an unprecedented amount; the previous record for a year had been less than one. Now it was Ls 281, just after perihelion, and high summer in the south. And the various abatement strategies for avoiding an ice age seemed to be working well; most of the new snow had melted in a hot spring, and now there were round lakes on every crater floor. The pond in the center of Christianopolis was about three meters deep, and three hundred meters across; this was fine with the Christians, as it gave them a nice park pond. But if the same thing happened every winter— and the meteorologists believed

that the coming winters would drop even more snow, and the coming summers get ever warmer— then their town would quickly be inundated by snowmelt, and Phillips Rim Crater Four become a lake full to the brim. And this was true for craters all over Mars.

The conference in Christianopolis had been convened to discuss strategies to deal with this situation. Nadia had done what she could to get influential people down to it, including meteorologists, hydrologists, and engineers, and the possibility of Sax, whose return was imminent. The problem of crater flooding was to be only the initial point of discussion for the whole question of watersheds, and the planetary hydrological cycle itself.

The crater problem specifically was to be solved as Nadia had predicted: plumbing. They would treat the craters like bathtubs, and drill drains to empty them. The brecciated pans under the dusty crater floors were extremely hard, but they could be tunneled through robotically; then install pumps and filters and pump the water out, keeping a central pond or lake if one wanted, or draining it dry.

But what were they going to do with the water they pumped out? The southern highlands were everywhere lumpy, shattered, pocked, cracked, hillocky, scarped, slumped, fissured, and fractured; when analyzed as potential watersheds, they were hopeless. Nothing led anywhere; there was no downhill for long. The entire south was a plateau three to four kilometers above the old datum, with only local bumps and dips. Never had Nadia seen more clearly the difference between this highland and any continent on Earth. On Earth, tectonic movement had pushed up mountains every few-score million years, and then water had run down these fresh slopes, following the paths of least resistance back to the sea, carving the fractal

vein patterns of watersheds everywhere. Even the dry basin regions on Earth were seamed with arroyos and dotted with playas. In the Martian south, however, the meteoric bombardment of the Noachian had hammered the land ferociously, leaving craters and ejecta everywhere; and then the battered irregular wasteland had lain there for two billion years under the ceaseless scouring of the dusty winds, tearing at every flaw. If they poured water onto this pummeled land they would end up with a crazy quilt of short streams, running down local inclines to the nearest rimless crater. Hardly any streams would make it to the sea in the north, or even into the Hellas or Argyre basins, both of which were ringed by mountain ranges of their own ejecta.

There were, however, a few exceptions to this situation. The Noachian Age had been followed by a brief “warm wet period” in the late Hesperian, a period perhaps as short as a hundred million years, when a thick warm CO₂ atmosphere had allowed liquid water to run on the surface, carving some river channels down the gentle tilts of the plateau, between crater aprons diverting them this way and that. And these watercourses had of course remained after the atmosphere had frozen out, empty arroyos gradually widened by the wind. These fossil riverbeds, like Nirgal Vallis, Warrego Valles, Protva Valles, Patana Valles, or Oltis Vallis, were narrow sinuous canyons, true riverine canyons rather than grabens or fossae. Some of them even had immature tributary systems. So efforts to design a macro-watershed system for the south naturally used these canyons as primary watercourses, with water pumped to the head of every tributary. Then there were also a number of old lava channels that could easily become rivers, as the lava, like the water, had tended to follow the path of least resistance downhill. And there were a number of tilted graben fractures and fissures, as at the foot of the Eridania Scopulus, that could likewise be turned to use.

In the conference, big globes of Mars were marked up daily to display different water regimes. There were also rooms full of 3-D topo maps, with groups standing around different watershed systems, arguing their advantages and disadvantages, or simply contemplating them, or fiddling with the controls to change them, restlessly, from one pattern to another. Nadia wandered the rooms looking at these hydrographies, learning much about the southern hemisphere that she had never known. There was a six-kilometer-high mountain near Richardson Crater, in the far south. The south polar cap itself was quite high. Dorsa Brevia, on the other hand, crossed a depression that looked like a ray cut out from the Hellas impact, a valley so deep that it ought to become a lake, an idea that the Dorsa Brevians naturally did not like. And certainly the area could be drained if they cared to do it. There were scores of variant plans, and every single system was strange looking to Nadia. Never had she seen so clearly how different a gravity-driven fractal was from impact randomness. In the inchoate meteoric landscape, almost anything was possible, because nothing was obvious— nothing except for the fact that in any possible system, some canals and tunnels would have to be built. Her new finger itched with the desire to get out there and run a bulldozer or a tunnel borer.

Gradually the most efficient, or logical, or aesthetically pleasing plans began to emerge from the proposals, the best for each region being patched together, in a kind of mosaic. In the eastern quadrant of the deep south, streams would tend to run toward Hellas Basin and through a couple of gorges into the Hellas Sea, which was fine. Dorsa Brevia accepted a plan to have their town's lava tunnel ridge become a kind of dam, crossing a watershed transversely so that there was a lake above it and a river below it, coursing down to Hellas. Around the south polar cap, snowfall would remain frozen, but most of the meteorologists predicted that

when things stabilized there wouldn't be much snowfall on the pole, that it would become a cold desert like Antarctica. Eventually of course they would end up with a largish ice cap, and then part of it would pool down into the huge depression under the Promethei Rupes, another partially erased old impact basin. If they didn't want too large of a southern ice cap, they would have to melt and pump some of the water back north, into the Hellas Sea perhaps. They would have to do some similar pumping in Argyre Basin, if they decided to keep Argyre dry. A group of moderate Red lawyers was even now insisting on this before the GEC, arguing that one of the two great dune-filled impact basins on the planet ought to be preserved. It seemed certain this claim would receive a favorable judgment from the court, and so all the watersheds around Argyre had to take this into account.

Sax had designed his own southern watershed plan, which he sent to the conference from their rocket as it aerobraked into orbital insertion, to be considered with all the rest. It minimized surface water, emptied most craters, used tunnels extensively, and channelized almost all drained water into the fossil river canyons. In his plan vast areas of the south would stay arid desert, making for a hemisphere of dry tableland, cut deeply by a few narrow river-bottomed canyons. "Water is returned north," he explained to Nadia in a call, "and if you stay up on the plateaus, it will look like it always did, almost."

So that Ann would like it, he was saying.

"Good idea," Nadia said.

And indeed Sax's plan was not that much different than the consensus being hammered out by the conference. Wet north, dry south; one more dualism to add to the great

dichotomy. And to have the old river canyons running with water again was satisfying. A good-looking plan, given the terrain.

But the days were long gone when Sax or anyone else could choose a terraforming project and then go out and do it. Nadia could see that Sax hadn't fully understood this. Ever since the beginning, when he had slipped algae-filled windmills into the field without the knowledge or approval of anyone but his accomplices, he had been working on his own. It was an ingrained habit of mind, and now he seemed to forget the review process that any watershed plan was going to have to go through in the environmental courts. But the process was there, inescapable now, and because of the grand gesture, half the fifty GEC justices were Reds of one shade or another. Any watershed proposal from a conference including Sax Russell, even as a teleparticipant, was going to get close and suspicious scrutiny.

But it seemed to Nadia that if the Red justices looked carefully at the proposal, they would have to be amazed at Sax's approach. Indeed it represented a kind of road-to-Damascus conversion— inexplicable, given Sax's history. Unless you knew all of it. But Nadia understood: he was trying to please Ann. Nadia doubted that was possible, but she liked to see Sax try. "A man full of surprises," she remarked to Art.

"Brain trauma will do that."

In any case, when the conference was done they had designed an entire hydrography, designating all the future major lakes and rivers and streams of the southern hemisphere. The plan would eventually have to be integrated with similar plans for the northern hemisphere, which were in considerable disarray by comparison, because

of the uncertainty about just how big the northern sea was going to be. Water was no longer being actively pumped up out of permafrost and aquifers— indeed many of the pumping stations had been blown up in the last year by Red ecoteurs— but some water was still rising, under the weight put on the land by the water already pumped. And summer runoff was flowing into Vastitas, more every year, both from the northern polar cap and the Great Escarpment; Vastitas was the catchment basin for huge watersheds on all sides. So a lot of water was going to pour into it every summer. On the other hand, a lot of water was always being stripped off by the arid winds, eventually precipitating elsewhere. And water would evaporate much faster than the ice currently there was subliming. So calculating how much was leaving and how much coming back was a modeler's field day, and estimates were still all over the map, literally so in that differences in prediction led to putative shorelines that were in some cases hundreds of kilometers apart.

That uncertainty would delay any GECO on the south, Nadia thought; in essence the court had to try to correlate all the current data, and evaluate the models, and then prescribe a sea level, and approve all watersheds accordingly. The fate of Argyre Basin in particular seemed impossible to decide at this point, before there was a northern plan; some plans called for pumping water up into Argyre from the northern sea if the northern sea got too full, to avoid flooding the Marineris canyons, South Fossa, and the new harbor towns being built. Radical Reds were already threatening to build “west-bank settlements” all over Argyre to forestall any such move.

So the GEC had yet another big issue to solve. Clearly it was becoming the most important political body on Mars; with the constitution and its own previous rulings to guide it, it was ruling on almost every aspect of their future. Nadia

thought that was probably as it should be; or at least that there was nothing wrong with it. They needed decisions with global ramifications reviewed globally, that was what it came down to.

But come what may in the courts, a provisional plan for the southern hemisphere had at least been formulated. And to everyone's surprise, the GEC gave the plan a positive preliminary judgment very soon after it was submitted—because, their ruling said, it could be activated in stages as water fell on the south, and it proceeded in much the same fashion through its first stages no matter what the eventual sea level in the north became. So there was no reason to delay beginning.

Art came in beaming with the news. “We can begin plumbing,” he said.

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But of course Nadia couldn't. There were meetings in Sheffield to go back to, decisions to be made, people to be convinced or coerced. Doggedly she did that work, stubbornly doing her duty whether she liked it or not, and as time passed she got better and better at it. She saw how she could subtly pressure other people to get her way; saw how people would do her bidding if she asked or suggested in certain ways. The constant stream of decisions honed some of her views; she found that it helped to have at least some consciously held political principles, rather than judging each case by instinct. It also helped to have reliable allies, on the council and elsewhere, rather than being a supposedly neutral and independent person. And so by degrees she found herself joining the Bogdanovists, who, to her surprise, conformed more closely to her political philosophy than anything else on Mars. Of course her

reading of Bogdanovism was relatively simple: things should be just, Arkady had insisted, and everyone free and equal; the past didn't matter; they needed to invent new forms whenever the old ones looked unfair or impractical, which was often; Mars was the only reality that counted, at least to them. Using these as her guiding principles, she found it easier to make up her mind about things, to see a course and cut for it directly.

Also she became more and more ruthless. From time to time she felt freshly how power could corrupt, felt it as a slight nausea within her. But she was getting habituated. She clashed often with Ariadne, and when she recalled the remorse she had felt after her first wrangle with the young Minoan, it seemed to her ridiculously overfastidious; she was far tougher than that every day now on people who crossed her, she showed the knives in meeting after meeting, in calculated microbursts of brutality that put people in line very effectively indeed. In fact the more she allowed herself to release little outbursts of fury and scorn, the more certainly she could control them and put them to some use. She was a power; and people knew it; and power was corrosive. Power was powerful, in more ways than one. And now Nadia felt very little remorse about that; they deserved a pop on the nose, generally; they had thought they were going to get a harmless old babushka to sit in the big chair while they worked their games on each other, but the big chair was the power seat, and she was damned if she was going to go through all this shit and not use some of that power to try to get what she wanted.

And so less and less often did she feel how ugly it was. Once when she did, after a particularly hard-nosed day, she thumped down in a chair and almost cried, sick with disgust. Only seven months of her three m-years had passed. What

would she become by the time her stint was done? Already she was used to power; by then she might even like it.

Art, worried by all this, squinted at her over their breakfast table. "Well," he said once, after she explained what was bothering her, "power is power." He was thinking hard. "You're the first president of Mars. So in a way you define the office. Maybe you should declare you're only going to work the one month and not the two months, and delegate the two months to your staff. Something like that."

She stared at him, mouth full of toast.

Later that week she abandoned Sheffield and went south again, joining a caravan of people working their way from crater to crater, installing drainage systems. Every crater had variations, but essentially it was a matter of picking the right angle to emerge from the crater apron, and then setting the robots to work. Von Karman, Du Toit, Schmidt, Agassiz, Heaviside, Bianchini, Lau, Chamberlin, Stoney, Dokuchaev, Trumpler, Keeler, Charlier, Suess . . . they plumbed all of those craters, and many more unnamed ones, although the craters were taking on names even faster than they drilled them: 85 South, Too Dark, Fool's Hope, Shanghai, Hiroko Slept Here, Fourier, Cole, Proudhon, Bellamy, Hudson, Kaif, 47 Ronin, Makoto, Kino Doku, Ka Ko, Mondragon. The migration from one crater to the next reminded Nadia of her trips around the south polar cap during the underground years; except now everything was out in the open, and through the nearly nightless midsummer days the team luxuriated in the sun, in the glary light off the crater lakes. They traveled across rough frozen bogs brilliant with sunny meltwater and meadow grass, and always of course they crossed the rust-and-black rockscape breaking out into the light, ring after ring, ridge after ridge. They plumbed craters and laid watershed pipes, and

attached greenhouse-gas factories to the excavators whenever the rock had any gas feedstocks in it.

But hardly any of that turned out to be work in the sense Nadia meant. She missed the old days. Of course operating a bulldozer had not been hand labor, but one's touch with the blade had been a very physical skill, and the repeated gearshifts physically taxing; and it was all around a higher level of engagement than this "work," which consisted of talking to AIs and then walking around and watching humming and buzzing teams of waist-high robot diggers, city-block-sized mobile factory units, tunnel moles with diamond teeth that grew back like sharks' teeth—everything made of bioceramic/metallic alloys stronger than the elevator cable, all of it out there doing it all by itself. It just wasn't what she had in mind.

Try again. She went through another cycle; return to Sheffield, engagement in the council work, increasing disgust, merging with despair; look around for anything to get her out of it; notice some likely project and seize on it. Run off to check it out. Like Art had said, she could call her own shots. There was that in power too.

The next time out it was soil that drew her. "Air, water, earth," Art said. "Next it'll be forest fires, eh?"

But she had heard that there were scientists in Bogdanov Vishniac trying to manufacture soil, and this interested her. So off she went, flying south to Vishniac, where she had not been for years. Art accompanied her. "It'll be interesting to see how the old underground cities adapt, now that there's no need to hide."

"I don't see why anyone stays down here, to tell you the truth," Nadia said as they flew down into the rugged southern polar region. "They're so far south their winters last forever. Six months with no sun at all. Who would stay?"

"Siberians."

"No Siberian in his right mind would move here. They know better."

"Laplanders, then. Inuit. People who like the poles."

"I suppose."

As it turned out, no one in Bogdanov Vishniac seemed to mind the winters. They had redistributed their mohole mound in a ring around the mohole itself, creating an immense circular amphitheater facing down into the hole. This terraced amphitheater was to be the surface Vishniac.

In the summers it would be a green oasis, and in the dark winters a white oasis; they planned to illuminate it with hundreds of brilliant streetlights, giving themselves a stage set day, in a town contemplating itself across a round gap in things, or from the upper wall looking out at the frosted chaos of the polar highlands. No, they were going to stay, no question of it. It was their place.

Nadia was greeted at the airport as a special guest, as always when she stayed with Bogdanovists. Before joining them this had struck her as ridiculous, and even a bit offensive: girlfriend of The Founder! But now she accepted their offer of a guest suite located on the lip of the mohole, with a slightly overhanging window that gave one a view straight down for eighteen kilometers. The lights on the mohole's bottom looked like stars seen through the planet.

Art was petrified, not at the sight but at the very thought of the sight, and he would not go near that half of the room. Nadia laughed at him, and then when she was done looking, closed the drapes.

The next day she went out to visit the soil scientists, who were happy at her interest. They wanted to be able to feed themselves, and as more and more settlers moved south, this was going to be impossible without more soil. But they were finding that manufacturing soil was one of the most difficult technical feats they had ever undertaken. Nadia was surprised to hear this— these were the Vishniac labs, after all, world leaders in technologically supported ecologies, having lived for decades hidden in a mohole. And topsoil was, well, soil. Dirt with additives, presumably, and additives one could add.

No doubt she conveyed some of this impression to the soil scientists, and the man named Arne leading her around told

her with some exasperation that soil was in fact *very* complex. About five percent of it by weight was made of living things, and this critical five percent consisted of dense populations of nematodes, worms, mollusks, arthropods, insects, arachnids, small mammals, fungi, protozoa, algae, and bacteria. The bacteria alone included several thousand different species, and could number as high as a hundred million individuals per gram of soil. And the other members of the microcommunity were almost as plentiful, in both number and variety.

Such complex ecologies could not be manufactured in the way Nadia had been imagining, which was basically to grow the ingredients separately and then mix them in a hopper, like a cake. But they didn't know all the ingredients, and they couldn't grow some of the ingredients, and some that they could grow died on mixing. "Worms in particular are sensitive. Nematodes have trouble too. The whole system tends to crash, leaving us with minerals and dead organic material. That's called humus. We're very good at making humus. Topsoil, however, has to grow."

"Which is what happens naturally?"

"Right. We can only try to grow it faster than it grows in nature. We can't assemble it, or manufacture it in bulk. And many of the living components grow best in soil itself, so there's a problem providing feedstock organisms at any faster rate than natural soil formation would provide them."

"Hmm," Nadia said.

Arne took her through their labs and greenhouses, which were filled with hundreds of pedons, tall cylindrical vats or tubes, in racks, all holding soil or its components. This was experimental agronomy, and from her experience with

Hiroko Nadia was prepared to understand very little of it. The esoterica of science could go right off her scale. But she did understand that they were doing factorial trials, altering the conditions in each pedon and tracking what happened. There was a simple formula Arne showed her to describe the most general aspects of the problem:

$$S = f(\text{PM}, \text{C}, \text{R}, \text{B}, \text{T}),$$

meaning that any soil property S was a factor (f) of the semi-independent variables, parent material (PM), climate (C), topography or relief (R), biota (B), and time (T). Time, of course, was the factor they were trying to speed up; and the parent material in most of their trials was the ubiquitous Martian surface clay. Climate and topography were altered in some trials, to imitate various field conditions; but mostly they were altering the biotic and organic elements. This meant microecology of the most sophisticated kind, and the more Nadia learned about it the more difficult their task seemed— not so much construction as alchemy. Many elements had to cycle through soil to make it a growth medium for plants, and each element had its own particular cycle, driven by a different collection of agents. There were the macronutrients— carbon, oxygen, hydrogen, nitrogen, phosphorus, sulfur, potassium, calcium, and magnesium— then the micronutrients, including iron, manganese, zinc, copper, molybdenum, boron, and chlorine. None of these nutrient cycles was closed, as there were losses due to leaching, erosion, harvesting, and outgassing; inputs were just as various, including absorption, weathering, microbial action, and application of fertilizers. The conditions that allowed the cycling of all these elements to proceed were varied enough that different soils encouraged or discouraged each cycle to different degrees; each kind of soil had particular pH levels, salinities, compaction, and so

forth; thus there were hundreds of named soils in these labs alone, and thousands more back on Earth.

Naturally in the Vishniac labs the Martian parent material formed the basis for most of the experiments. Eons of dust storms had recycled this material all over the planet, until it had everywhere much the same content: the typical Martian soil unit was made up of fine particles of mostly silicon and iron. At its top it was often loose drift. Below that, varying degrees of interparticle cementation had produced crusty cloddy material, becoming blocky the lower one dug.

Clays, in other words; smectite clays, similar to Terra's montmorillonite and nontronite, with the addition of materials like talc, quartz, hematite, anhydrite, dieserite, clacite, beidellite, rutile, gypsum, maghemite and magnetite. And everything had been coated by amorphous iron oxyhydroxides, and other more crystallized iron oxides, which accounted for the reddish colors.

So this was their universal parent material: iron-rich smectite clay. Its loosely packed and porous structure meant it would support roots while still giving them room to grow. But there were no living things in it, and too many salts, and too little nitrogen. So in essence their task was to gather parent material, and leach out salt and aluminum, while introducing nitrogen and the biotic community, all as fast as possible. Simple, when put like that; but that phrase *biotic community* masked a whole world of troubles. "My God, it's like trying to get this government to work," Nadia exclaimed to Art one evening. "They're in big trouble!"

Out in the countryside people were simply introducing bacteria to the clay, and then algae and other microorganisms, then lichen, and then halophyllic plants. Then they had waited for these biocommunities to transform

the clay into soils, through many generations of living and dying in it. This worked, and was working even now, all over the planet; but it was very slow. A group in Sabishii had estimated that when averaged over the planet's surface, about a centimeter of topsoil was being generated every century. And this had been achieved using genetically engineered populations designed to maximize speed.

In the greenhouse farms, on the other hand, the soils used had been heavily amended by nutrients and fertilizers and inoculants of all kinds; the result was something like what these scientists were trying for, but the quantity of soil in greenhouses was minuscule compared to what they wanted to put out on the surface. Mass producing soil was their goal. But they had gotten into something deeper than they had expected, Nadia could tell; they had the vexed absorbed air of a dog gnawing on a bone too big for its mouth.

The biology, chemistry, biochemistry, and ecology involved in these problems were far beyond Nadia's expertise, and there was nothing she could do to make suggestions there. In many cases she couldn't even understand the processes involved. It was not construction, nor even an analog of construction.

But they did have to incorporate some construction into whatever production methods they tried, and there Nadia was at least able to understand the issues. She began to concentrate on that aspect of things, looking at the mechanical design of the pedons, and also the holding tanks for the living constituents of the soil. She also studied the molecular structure of the parent clays, to see if it suggested anything to her about working with them. Martian smectites were aluminosilicates, she found, meaning each unit of the clay had a sheet of aluminum octahedrals sandwiched between two sheets of silicon tetrahedrals; the different

kinds of smectites had different amounts of variation in this general pattern, and the more variation there was, the easier it was for water to seep into the interlayer surfaces. The most common smectite clay on Mars, montmorillonite, had a lot of variety, and so was very open to water, expanding when wet, and shrinking when dry to the point of cracking.

Nadia found this interesting. “Look,” she said to Arne, “what about a pedon filled with a matrix of feeder veins, which would introduce the biota all through the parent material.” Take a batch of parent material, she went on, and get it wet, then let it dry. Insert into the crack systems the feeder vein matrix. Then pour in whatever important bacteria and other constituents they could grow. Then if the bacteria and other creatures could eat their way out of their feeder veins, digesting that material as they emerged, they would all suddenly be there together in the clay, interacting. That would be a tricky time, no doubt many trials would be necessary to calibrate the initial amounts of the various biota needed to avoid population booms and crashes— but if they could get them to settle into their usual communities, then they would suddenly have living soil. “There are feeder-vein systems like this used for certain quick-setting construction materials, and now I hear that doctors feed apatite paste into broken bones the same way. The feeder veins are made of protein gels appropriate to whatever substance they’re going to contain, molded into the appropriate tubular structures.”

A matrix for growth. Worth looking into, Arne said. Which made Nadia smile. She went around that afternoon feeling happy, and that evening when she joined Art she said, “Hey! I did some work today.”

“Well!” Art said. “Let’s go out and celebrate.”

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Easy to do, in Bogdanov Vishniac. It was a Bogdanovist city, all right, as buoyant as Arkady himself. A party every night. They had often joined the evening promenade, and Nadia loved walking along the railing of the highest terrace, feeling that Arkady was somehow there, had somehow persisted. And never more so than on this night, celebrating a bit of work done. She held Art's hand, looked down and across at the crowded lower terraces and their crops, orchards, pools, sports fields, lines of trees, arcuate plazas occupied by cafés, bars, dance pavilions— bands battling for sonic space, the crowds chugging around them, some dancing but many more simply making the night's promenade, like Nadia herself. All this still under a tent, with tenting that they hoped to remove someday; meanwhile it was warm, and the young natives wore an outlandish array of pantaloons, headdresses, sashes, vests, necklaces, so that Nadia was reminded of the video footage of Nirgal and Maya's reception in Trinidad. Was this coincidence, or was there some supraplanetary culture coming into being among the young? And if there was, did that mean that their Coyote, the Trinidadian, had invisibly conquered the two worlds? Or her Arkady, posthumously? Arkady and Coyote, culture kings. It made her grin to think of it, and she took sips of Art's cup of scalding kavajava, the drink of choice in this cold town, and watched all the young people moving like angels, always dancing no matter what they did, flowing in graceful arcs from terrace to terrace. "What a great little town," Art said.

Then they came upon an old photo of Arkady himself, framed and hung on a wall next to a door. Nadia stopped and clutched Art's arm: "That's him! That's him to the life!"

The photo had caught him talking with someone, standing just inside a tent wall and gesturing, his hair and beard lofting away from his head and blending into a landscape exactly the color of his wild curls. A face coming out of a hillside, it seemed, blue eyes squinting in the glare of all that red glee. “I’ve never seen a photo that looked so much like him. If he saw a camera pointed at him he didn’t like it, and the picture came out wrong.”

She stared at the photo, feeling flushed, and strangely happy; such a lifelike encounter! Like running into someone again after years of not seeing them. “You’re like him, in some ways, I think. But more relaxed.”

“It looks like it would be hard to get much more relaxed than that,” Art said, peering closely at the photo.

Nadia smiled. “It was easy for him. He was always sure he was right.”

“None of the rest of us have that problem.”

She laughed. “You’re cheerful like he was.”

“And why not.”

They walked on. Nadia kept thinking of her old companion, seeing the photo in her mind’s eye. There was still so much she remembered. The feelings connected to the memories were fading, however, the pain blunted— the fixative leached out, all that flesh and trauma now only a pattern of a certain kind, like a fossil. And very unlike the present moment, which, looking around, feeling her hand in Art’s, was real, vivid, brief, perpetually changing— alive. Anything could happen, everything was felt.

“Shall we go back to our room?”

• • •

The four travelers to Earth returned at last, coming down the cable to Sheffield. Nirgal and Maya and Michel went their ways, but Sax flew down and joined Nadia and Art in the south, a move which pleased Nadia no end. She had come to have the feeling that wherever Sax went was the heart of the action.

He looked just as he had before the trip to Earth, and was if anything even more silent and enigmatic. He wanted to see the labs, he said. They took him through them.

“Interesting, yes,” he said. Then after a while: “But I’m wondering what else we might do.”

“To terraform?” Art asked.

“Well . . .”

To please Ann, Nadia thought. That was what he meant. She gave him a hug, which surprised him, and she kept her hand on his bony shoulder as they talked. So good to have him there in the flesh! When had she gotten so fond of Sax Russell, when had she come to rely on him so much?

Art too had figured out what he meant. He said, “You’ve done quite a bit already, haven’t you? I mean, at this point you’ve dismantled all the metanats’ monster methods, right? The hydrogen bombs under the permafrost, the soletta and aerial lens, the nitrogen shuttles from Titan—”

“Those are still coming,” Sax said. “I don’t even know how we could stop them. Shoot them down I guess. But we can always use nitrogen. I’m not sure I’d be happy if they were stopped.”

“But Ann?” Nadia said. “What would Ann like?”

Sax squinted again. When uncertainty squinched his face, it reverted to precisely its old ratlike expression.

“What would you both like?” Art rephrased it.

“Hard to say.” And his face twisted into a grimace of uncertainty, indecision, split motives.

“You want wilderness,” Art suggested.

“Wilderness is a, an idea. Or an ethical position. It can’t be everywhere, it’s not that kind of idea. But . . .” Sax wagged a hand, fell back into his own thoughts. For the first time in the century she had known him, Nadia had the sense that Sax did not know what to do. He solved the problem by sitting down before a screen and typing instructions into it. He appeared to forget their presence.

Nadia squeezed Art’s arm. He enfolded her hand, and squeezed the little finger gently. It was almost three quarters size now, but slowing down as it got closer to full size. A nail had been started, and on the pad, the delicate whorled ridges of a fingerprint. It felt good when it was squeezed. She met Art’s eye briefly, then looked down. He squeezed her whole hand before letting go. After a while, when it was clear Sax was fully distracted, and going to be off in his own world for a long time, they tiptoed off to their room, to the bed.

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They worked by day, went out at night. Sax was blinking around as in his lab-rat days, anxious because there was no news of Ann. Nadia and Art comforted him as best they could, which wasn’t much. In the evenings they went out

and joined the promenade. There was a park where parents congregated with their kids, and people walked by as if passing a little open zoo enclosure, grinning at the sight of the little primates at play. Sax spent hours in this park talking to kids and parents, and then he would wander off to the dance floors, where he danced by himself for hours. Art and Nadia held hands. Her finger got stronger. It was almost full size now, and given that it was the littlest finger anyway, it looked full grown unless she held it against its opposite number. Art nibbled it gently sometimes when they were making love, and the sensation drove her wild. “You’d better not tell people about this effect,” he muttered, “else it could get grisly— people hacking off body parts to grow them back, you know, more sensitive.”

“Sicko.”

“You know how people are. Anything for a thrill.”

“Don’t even talk about it.”

“Okay.”

• • •

But then it was time to get back to a council meeting. Sax left, to find Ann or hide from her, they couldn’t be sure; they flew back up to Sheffield, and then Nadia was back into it again, every day parsed into its thirty-minute units of trivia. Except some of it was important. The Chinese application for another space elevator near Schiaparelli had come up for action, and it was only one of many immigration issues that were facing them. The UN-Mars agreement worked out in Bern stated explicitly that Mars was to take at least ten percent of its population in immigrants every year, with the hope expressed that they would take even more— as many as possible— for as long as the hypermalthusian conditions

obtained. Nirgal had made this a kind of promise, had spoken very enthusiastically (and Nadia felt unrealistically) about Mars coming to the rescue, saving Earth from overpopulation with the gift of empty land. But how many people could Mars really hold, when they couldn't even manufacture topsoil? What was the carrying capacity of Mars, anyway?

No one knew, and there was no good way to calculate it scientifically. Estimates of Terra's human carrying capacity had ranged from one hundred million to two hundred trillion, and even the seriously defensible estimates ranged from two to thirty billion. In truth carrying capacity was a very fuzzy abstract concept, depending on an entire recombinant host of complexities such as soil biochemistry, ecology, human culture. So it was almost impossible to say how many people Mars could handle. Meanwhile Earth's population was over fifteen billion, while Mars, with almost as much land surface, had a population a thousand times as small, at right around fifteen million. The disparity was clear. Something would have to be done.

Mass transfer of people from Earth to Mars was certainly one possibility; but the speed of the transfer was limited by the size of the transport system, and the ability of Mars to absorb the immigrants. Now the Chinese, and indeed the UN generally, were arguing that as a beginning step in a process of intensified immigration, they could build up the transport system very substantially. A second space elevator on Mars would be the first step in this multistage project.

Reaction on Mars to this plan was mostly negative. The Reds of course opposed further immigration, and while conceding that some would have to happen, they opposed any specific development of the transfer system just to try to keep the process slowed down as much as possible. That position fit

their overall philosophy, and made sense to Nadia. The Free Mars position, however, while more important, was not so clear. Nirgal had come out of Free Mars, and had gone to Earth and issued a general invitation to Terrans to shift as many people over as they could. And historically Free Mars had always argued for strong ties with Earth, to attempt the so-called tail-wagging-dog strategy. The current party leadership, however, no longer seemed very fond of this position. And Jackie was in the middle of this new group. They had been shifting toward a more isolationist stance even during the constitutional congress, Nadia recalled, arguing always for more independence from Earth. On the other hand, they had been apparently cutting deals in private with certain Terran countries. So the Free Mars position was ambiguous, perhaps hypocritical; and seemed designed mainly to increase its own power on the Martian scene.

Even setting aside Free Mars, though, there was a lot of isolationist sentiment out there besides the Reds— anarchists, some Bogdanovists, the Dorsa Brevian matriarchs, the MarsFirsters— all tended to side with the Reds on this issue. If millions and millions of Terrans began to pour up onto Mars, they all argued, what then of Mars— not just of the landscape itself, but of the Martian culture that had been forming over the m-years? Wouldn't that be drowned in the old ways brought up by the new influx, which might quickly outnumber the native population? Birth rates were dropping everywhere, after all, and childlessness and one-child families were as common on Mars as on Earth — so there wouldn't be any great multiplication in the native population to look forward to. They would soon be overwhelmed.

So Jackie argued, at least in public, and the Dorsa Brevians and many others agreed with her. Nirgal, just back from

Earth, seemed not to be having much effect on that stance. And while Nadia could see the point of her opponents' arguments, she also felt that given the situation on Earth, they were being unrealistic to think they could close Mars down. Mars could not save Earth, as Nirgal had sometimes seemed to say during his visit there; but an agreement with the UN had been made and ratified, and they were committed to letting up at least as many Terrans as the treaty specified. So the bridge between the worlds had to be expanded if they were to meet that obligation, and keep the treaty viable. If they didn't stick to the treaty, Nadia thought, anything might happen.

So in the debate over allowing a second cable, Nadia argued for it. It increased the capacity of the transport system, as they had promised to do, if only indirectly. And it would also take some of the pressure off the towns on Tharsis, and that side of Mars generally; population density maps showed that Pavonis was like the bull's-eye of a target, with people radiating outward from it and settling as near to it as was convenient. Having a cable on the other side of the world would help to equalize things.

But this was a dubious value to the cable's opponents. They wanted the population localized, contained, slowed. The treaty didn't matter to them. So when it came to a council vote, which was only an advisory to the legislature in any case, only Zeyk voted with Nadia. It was Jackie's biggest victory so far, and put her in a temporary alliance with Irishka and the rest of the environmental courts, which were on principle resistant to all forms of swift development.

Nadia went home to her apartment that day, discouraged and worried. "We've promised Earth we'll take lots of immigrants, then pulled up the drawbridge. It's going to lead to trouble."

Art nodded. "We'll have to work something out."

Nadia blew out her breath in disgust. "Work. We won't *work* anything out. Work isn't the word for it. We will bicker and dicker and argue and natter." She sighed a big sigh. "It will go on and on. I thought Nirgal being back would help, but it won't if he doesn't join in."

"He doesn't have a position," Art said.

"He could if he wanted one, though."

"True."

Nadia thought about it, her mind wandering as her spirits dropped. "You know I've only gotten through ten months of my term. There's over two and a half m-years to go."

"I know."

"M-years are so damned long."

"Yes. But the months are short."

She made a noise at him. Stared out the window of her apartment, down into Pavonis caldera. "The trouble is that work isn't work anymore. You know, we go out there and join these projects, and the work on them still isn't work. I mean I never get to go out and *do* things. I remember when I was young, in Siberia, work was really work."

"You might be romanticizing that a bit."

"Yeah, sure, but even on Mars. I remember putting together Underhill. That was really fun. And one day on our trip to the north pole, installing a permafrost gallery. . . ." She sighed. "What I wouldn't give for work like that again."

“There’s still a lot of construction going on,” Art pointed out.

“By robots.”

“Maybe you could go back to something more human. Build something yourself. A house in the country, or a development. Or one of the new harbor towns, hand-built to try out different things, designs, methods, whatever. It would slow the construction process down, the GEC would go for that.”

“Maybe. After my term is over, you mean.”

“Or even before. On breaks, like these other trips. They’ve all been analogs to construction, they haven’t been construction itself. Building actual things. You have to try that, then go back and forth between the two.”

“Conflict of interest.”

“Not if it was a public-works project. What about that proposal to build a global capital down at sea level?”

“Hmm,” Nadia said. She got out a map, and they pored over it. At the zero-longitude line, the south shore of the northern sea bent out in a little round peninsula, with a crater bay at its center. It was about halfway between Tharsis and Elysium. “We’ll have to go take a look.”

“Yes. Here, come to bed. We’ll talk about it more later. Right now I have another idea.”

Some months later they were flying back from Bradbury Point to Sheffield, and Nadia remembered that conversation with Art. She asked the pilot to land at a little station north of Sklodowska Crater, on the slope of Crater Zm, called Zoom. As they descended on the airstrip they saw to the east a big bay, now covered with ice. Across the bay was the rough mountainous country of Mamers Vallis, and the Deuteronilus Mensae. The bay was an incursion into the Great Escarpment, which was here fairly gentle. Longitude zero. Latitude forty-six degrees north, fairly far north; but the northern winters were mild compared to the south. They could see a lot of the icy sea, lying off a long shoreline. The rounded peninsula surrounding Zoom was high and smooth. The little station on the shore was home to about five hundred people, who were out there building with bulldozer and cranes and dredges and draglines. Nadia and Art got out and sent the plane on, and took a boardinghouse room and spent about a week with the people there, talking about the new settlement. The locals had heard of the proposal to build a new capital city here on the bay; some of them liked the idea, some didn't. They had thought of calling their settlement Greenwich because of its longitude, but they had heard the British didn't pronounce it "Green Witch," and they didn't know how they felt about spelling the town to sound that way and then calling it "Grenich." Maybe just London, they said. We'll think of something, they said. The bay itself, they said, had long been called Chalmers Bay.

"Really?" Nadia exclaimed. She laughed. "How perfect."

She was already very attracted to the landscape: Zoom's smooth conic apron, the incurve of the big bay; red rock over white ice, and presumably over blue sea, someday. On the days of their visit clouds flowed by constantly, riding the west wind and dappling both land and ice with their

shadows— sometimes puffy white cumulus clouds, like galleons, other times scrolled herringbone patterns unrolling overhead, defining the dark dome of sky above them, and the curving rocky land under them. It could be a small handsome city, encircling a bay like San Francisco or Sydney, as beautiful as those two but smaller, human scale — Bogdanovist architecture— hand-built. Well, not exactly hand-built, of course. But they could design it at a human scale. And work on it as a kind of work of art. Walking with Art on the shores of the ice bay, Nadia talked through her CO2 mask about these ideas, while watching the parade of clouds gallop by in the low-rushing air.

“Sure,” Art said. “It would work. It’s going to be a city anyway, that’s the important thing. It’s one of the best bays on this stretch of the coast, so it’s bound to be used as a harbor. So you wouldn’t get the kind of capital city that just sits in the middle of nowhere, like Canberra or Brasilia, or Washington, D.C. It’ll have a whole other life as a seaport.”

“That’s right. That would be great.” Nadia walked on, excited as she thought about it, feeling better than she had in months. The movement to establish a capital somewhere else than Sheffield was strong, supported by almost every party up there. This bay had already been proposed as a site by the Sabishiians, so it would be a matter of supporting an already-existing idea, rather than forcing a new one on people. The support would be there. And as a public-works project, building it would be something she could take full part in. Part of the gift economy. She might even be able to have an influence on the plan of it. The more she thought about it, the more pleased she got.

They had walked far down the shore of the bay; they turned around and began to walk back to the little settlement. Clouds tumbled over them on a stiff wind. The curve of red

land made its greeting to the sea. Just under the cloud layer, a ragged V of honking geese fletched the wind, heading north.

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Later that day, as they flew back to Sheffield, Art picked up her hand and held it, inspecting her new finger. He said slowly, "You know, building a family would also be a very hands-on kind of construction."

"What?"

"And they've got reproduction pretty much figured out."

"What?"

"I said, as long as you're alive, you can pretty much have children, one way or another."

"What?"

"That's what they say. If you wanted to, you could do it."

"No."

"That's what they say."

"No."

"It's a good idea."

"No."

"Well, you know, even building . . . it's great, sure, but you can only go on plumbing for so long. Plumbing, hammering nails, bulldozing— it's all interesting enough, of course, I guess, but still. We have a lot of time to fill. And the only

work really interesting enough to pursue over the long haul would be raising a kid, don't you think?"

"No I do not!"

"But did you ever have a kid?"

"No."

"Well there you go."

"Oh God."

Her ghost finger was tingling. But now it was really there.